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THE EMPLOYMENT OF DISEASE-CAUSING MICROBES FOR THE DESTRUCTION OF FIELD MICE, MOLES AND SIMILAR VERMIN.

BY GERALD M'CARTHY, N. C. AGR. EXPT. STATION.

THE loss annually caused by field mice, moles, gophers, hares and other rodents, is in the United States an indefinite quantity, but must in the aggregate amount to several millions of dollars. In California and Colorado the jack-rabbit, *Lepus Californicus*, and sage rabbit, *L. artemisia*, are very serious pests, while in the eastern states *L. sylvaticus*, the cotton tail, and *L. palustris*, the swamp coney, are depredators in grain shocks and growing crops.

The gophers, *Geomys*, and other genera, are very destructive in the grain fields of the arid West. The damage wrought during winter by gnawing mice and hares in the orchards of the eastern states is a matter of no small consequence to fruit growers, and nursery-men and gardeners raise a continuous howl against the ground mole.

The damage caused in Australia by the introduced rabbit is enormous—almost exceeding belief. In Europe the worst pests of the rodent family are the common field mice, *Arvicola arvolis* and *Mus sylvaticus*, called in France *campagnols* and *mulots*, respectively.

How to destroy these vermin on a large scale and over wide areas, without destroying at the same time useful animals, has recently engaged the attention of many European scientists. In the United States the use of poisoned grain, and more recently of carbon bisulphide for the burrowing species, has given the most satisfactory results, but in various countries of the Old World the employment of pathogenic bacteria for this purpose has given a gratifying success.

In a paper recently presented to the French Academy by M. Jean Danyasz, a destructive, spontaneous epidemic among these animals in the Commune of Charny is described in detail, and experiments reported to show that while highly contagious and fatal to all small rodents, it is quite innocuous to cats, dogs, fowls, domestic animals and human beings. The specific bacillus was isolated by the culture method and was subsequently employed on a large scale to destroy the vermin infesting an area of about seventy-five hectares. The whole number of rodents infesting this space was calculated at from 10,000 to 30,000,—*Arvicola arvolis* being in the majority.

The process of infecting the field with the pathogenic germs was substantially as follows: The contents of ten dozen of gelatin culture tubes containing the bacillus were dissolved in fifty litres of water, and in this was soaked about 80,000 cubes of bread of about 1 c.c.m. The bread was then scattered throughout the field, a morsel being placed near every hole showing recent traces of an occupant. The operation occupied twenty persons two hours daily, from four to six p.m., for three consecutive days. The total cost of the treatment amounted to about 3 1/2 francs per hectare, or about thirty cents per acre. Within three days after the distribution of the infectious bread, sick and dying mice were plentiful in the field, and autopsies of several showed the presence of the microbe in their blood. The bread was distributed over the infested fields September 29 *et seq.*, and on October 15 scarcely a living mouse could be found in the infected area, though abundant enough in neighboring non-treated fields. Opening the burrows of the rodents showed their galleries to be filled with dead mice.

This same process was tried in several other departments of the republic, and always with similar success, insomuch that the author concludes that in this microbe

farmers whose fields are infested by gnawing rodents have a simple, inexpensive and certain remedy.

The identification of the bacillus is not given in the paper referred to, but is promised in a future communication to the Academy. The author states that it is very similar to the bacillus of duck cholera, but not identical, nor are ducks or other fowls susceptible to the disease.

SCIENTIFIC WASHINGTON.

THERE are now seven associated scientific societies in Washington, having a combined membership of 1524, comprising 1138 persons. These societies and their membership are as follows:

Anthropological, 205; Biological, 190; Chemical, 102; Entomological, 38; Geographic, 619; Geological, 137; Philosophical, 233. These numbers indicate the active resident membership: there are in addition 472 members, a few honorary, the remainder active, though residing elsewhere.

These organizations include many men eminent in science and in official life. Among officials are Hon. H. A. Herbert, Secretary of the Navy; Hon. J. Sterling Morton, Secretary of Agriculture; Major J. W. Powell, Director United States Geological Survey; T. C. Mendenhall, Superintendent United States Coast and Geodetic Survey; Professors S. P. Langley and G. Brown Goode, Secretary and Assistant Secretary of the Smithsonian Institution; Col. Marshall McDonald, Commissioner of Fisheries; Prof. Simon Newcomb, Superintendent Nautical Almanac; Dr. Frank Baker, Manager National Zoological Park; Prof. W. J. McGee, in charge United States Bureau of Ethnology (who has the unique distinction of being a member of all seven societies); Prof. M. W. Harrington, Superintendent Weather Bureau; Prof. W. T. Harris, Commissioner of Education; Mr. A. R. Spofford, Librarian of Congress; Prof. John R. Proctor, President Civil Service Commission; General A. W. Greely, Chief Signal Officer; Surgeon-General George M. Sternberg; Dr. John S. Billings, of the Army Medical Museum; Dr. C. W. Dabney, Assistant Secretary of Agriculture; Dr. B. E. Fernow, Chief of Division of Forestry, Department of Agriculture; Professors Eastman, Hall and Harkness, of the United States Naval Observatory, and many other prominent officers of the Government.

Congress is represented by Senators Manderson, Vilas, Perkins, Squire, and Wilson, and Representatives Baker, Belknap and Stevens.

From the army and navy are many officers whose names are well known, among them General S. V. Benét, General J. C. Breckinridge, General T. L. Casey, Commodore O. C. Badger, Chief Engineer George W. Melville, Dr. J. Mills Browne, Dr. G. H. Beyer, Dr. N. L. Bates, Captain W. T. Sampson and Captain Rogers Birnie.

Every branch of science is represented in these societies, and among many distinguished names a few may be found that are eminent in more than one sphere of research. Here is Prof. Lester F. Ward, who is not only a noted paleobotanist, but a profound student of sociology, and the author of "Dynamic Sociology," "The Psychic Factors of Civilization" and other works; also that of Mr. W. H. Holmes, who is known not only as a geologist and archaeologist, but also as an artist; and that of Mr. Henry Gannett, chief topographer of the United States Geological Survey and author of numerous sociologic and economic papers, including a recent book entitled "The Building of a Nation."

Among geologists are Professors G. K. Gilbert, S. F. Emmons, Arnold Hague, George F. Becker, J. S. Diller,

and Bailey Willis, son of Nathaniel P. Willis, the poet and littérateur.

Among palæontologists are Dr. W. H. Dall, Dr. C. A. White, Mr. C. D. Walcott and Mr. Robert T. Hill.

Among chemists are Professors F. W. Clarke, H. W. Wiley, R. B. Warder, and C. E. Munroe, Dr. J. M. Toner, Mr. W. F. Hillebrand and Mr. T. M. Chatard.

Biological science is represented in all its branches—botany by Mr. George B. Sudworth, Mr. F. V. Coville, Mr. W. R. Smith, Dr. Erwin F. Smith, Mr. B. T. Gallo-way and Mr. F. H. Knowlton; entomology by Prof. C. V. Riley, Mr. L. O. Howard, Mr. W. H. Ashmead and Mr. George Marx; ichthyology by Prof. Theodore N. Gill, Dr. Tarleton H. Bean, and Mr. Richard Rathbun; ornithology by Mr. Robert Ridgway, Dr. Elliott Coues, and Mr. H. W. Henshaw; mammalogy by Prof. F. A. Lucas, Mr. C. Hart Merriam and Mr. F. W. True.

Professors Cleveland Abbe and F. H. Bigelow, meteorologists, are enrolled, and Messrs. H. M. Wilson and F. H. Newell, whose work in the arid West upon problems of irrigation has given them prominence.

Among anthropologists are Colonel Garrick Mallery, Dr. Robert Fletcher, Prof. O. T. Mason, Mr. James C. Pilling, Mr. Thomas Wilson, Mr. F. H. Cushing, Drs. Cyrus Thomas, J. Owen Dorsey and A. S. Gatschet, Captain J. G. Bourke and Mr. James Mooney.

Outside the sphere of technical science many distinguished names appear in the list of members. Here are the venerable Alexander Melville Bell and his son, Alexander Graham Bell, the inventor of the telephone.

Education is represented by Dr. James C. Welling, President of Columbian University, Prof. W. B. Powell, Superintendent of the Public Schools of Washington, President J. E. Rankin, of Howard University, and President E. M. Gallaudet, of the National College for the Deaf.

Literature and journalism are represented by Mr. Henry Adams, the historian, Mr. George Kennan, Mr. William E. Curtis, Mr. C. S. Noyes, Mr. T. W. Noyes; Mr. S. H. Kauffman, Mr. H. L. West, Mr. H. B. Macfarland, Mr. Harry Godwin, Mr. W. A. Croffut, Mr. E. B. Wight, Mr. Henry Farquhar, Mr. C. R. Dodge, and Mr. Clifford Howard.

Other well-known members are Mr. Gardiner G. Hubbard, Mr. B. H. Warner, Mr. John Tweedale, Dr. Swan M. Burnett, Prof. A. H. Thompson, Prof. Gilbert Thompson, Dr. R. W. Shufeldt, Dr. Cyrus Adler, Rev. Teunis S. Hamlin, Rev. G. M. Searle, Dr. Joseph Pohle, Rev. J. G. Hagen, Dr. A. F. A. King, Dr. L. C. Loomis, Mr. John Joy Edson, Rev. J. Macbride Sterrett, Mr. William B. Taylor, Mr. Edward Clark, Prof. H. L. Hodgkins, Dr. Theobald Smith, Dr. D. E. Salmon, Mr. Henry Ulke, Mr. J. Stanley Brown, Major William H. Webster, Mr. A. B. Johnson, Dr. H. C. Yarrow, Mr. C. J. Bell, Mr. Edwin Willits, Mr. W. A. De Cindry, Mr. J. Ormond Wilson, and Mr. W. B. Chilton.

Among ladies enrolled are Mrs. Caroline H. Dall, Miss Alice Fletcher, Miss Kate Foote, Mrs. J. M. Lander (who will be remembered by old play-goers as Miss Jean Davenport), Dr. Anita Newcomb McGee, Mrs. E. R. Scidmore, Miss Sara A. Scull, Mrs. M. C. Stevenson, Mrs. L. O. Talbott, and Miss Haidee Williamson.

Meetings of the societies are held monthly or semi-monthly from October to May at the Cosmos Club, at Madison Place and I Street, and at each meeting two or more papers are usually read and discussed.

Most significant is the extent of the out-of-town membership of these societies, including some of the best-known scientific men in the country, among them Prof. W. O. Atwater, of Wesleyan University; Dr. F. Bascom, Ohio State University; Dr. J. C. Branner, Leland Stan-

ford University; Prof. T. C. Chamberlin, University of Chicago; President John M. Coulter, Indiana University; Dr. Thomas Craig, Johns Hopkins University; Prof. W. R. Dudley, Leland Stanford University; President Daniel G. Gilman, Johns Hopkins University; Prof. E. L. Greene, University of California; Prof. E. S. Holden, Lick Observatory; Prof. E. S. Morse, Peabody Academy of Science; Prof. H. S. Pritchett, Washington University, St. Louis; Prof. I. C. Russell, University of Michigan; Prof. H. M. Seely, Middlebury College, Vermont; Prof. D. P. Todd, Amherst, Mass.; Prof. Winslow Upton, Brown University, R. I.; Prof. C. R. Van Hise, University of Wisconsin; Prof. George H. Williams, Johns Hopkins University; Prof. H. S. Williams, Yale; Prof. Alex. Ziwet, University of Michigan; Prof. J. E. Whitfield, Philadelphia; Dr. Washington Matthews; Major C. E. Dutton and Mr. Charles Nordhoff.

The constant increase in the number of this class of members is an indication that Washington is rapidly becoming a national centre of scientific thought.

GOLDEN SANDS OF THE PACIFIC COAST.

BY CLARENCE M. BUEL, E.M., ST. PAUL, MINN.

THESE auriferous deposits denominated "Black sands" occur at intervals from Takutat Bay, some 250 miles north of Sitka in Alaska to Santa Cruz Bay, California, and have been worked for many years with primitive appliances, sluice box and pan, the gold being fine flake or flour, less than twenty-five per cent being saved. These deposits already mined, milled and on the dump, ready to work, contain a sufficient quantity of gold to more than pay the national debt, *could it be saved*, but the prospector finding two hundred colors in his pan, little thinks that the color visible to the naked eye is but the 1,000,000th part of a grain, finds it so alluring that he at once rigs up a rough sluice box, and often sends a sample to an assayer who gives him returns from \$5 to \$40 per ton, wonders that he seldom makes more than \$4 per day, though other methods have been pursued in attempting to separate the gold from the sands too numerous to relate. Accompanying the gold is found platinum and nearly all the platinoid metals. Chlorination has been tried without success, and the cyanide process (McArthur-Forrest patent) proved a failure, the reason chiefly being that the magnetic iron of which these deposits are largely composed converts the cyanide of potassium into a ferro-cyanide, and the zinc used in precipitation rendered inert by reason of its speedy oxidation in the humid saline atmosphere to which it must needs be subjected. On the Oregon coast, at the mouth of the Coquille, the camp of a thousand miners a few years since is now reduced to a single miner. There are old beaches miles back from the present beaches, with beds several feet in thickness, rich in gold, inexhaustible in extent, unworked now and awaiting some method by which the precious metal may be extracted. This state of affairs exists at Gold Beach, Port Orford, Yaquina Bay, Peterson's Point, and over one hundred other localities. Yet each year sees its quota of Chinese working in their crude manner and paying a royalty of \$1 per foot for the privilege. The magnetic iron forms nearly 40/100 and is a mixture of the protoxide and sesquioxide of iron, having 72 parts metallic iron to 28 of oxygen. It is quite hard and scratches glass; strongly magnetic, it is the same as the lodestone, excepting that the latter possesses polarity. It is found in nature disseminated through granite, gneiss, mica, slate, syenite, hornblende slate, chlorite slate and limestone, and is suitable for making the finest quality of steel. Zircon is also found, though too small to be noticed except mineralogically.